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EX PARTE OR LATE FILED December 19, 2002

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Marlcne H. Dortch, Esq.
Secretary
Federal Communications Commission
445 - 12th Street, SW, Room 8B201
Washington. DC 20554

Re: *Ex Parte* Notice of Presentation in ET Docket 98-153

Dear Ms. Dortch:

Multispectral Solutions, Inc. ("MSSI"), by its counsel, hereby notifies the Commission of an *ex parte* presentation by MSSI at a meeting held on December 18, 2002, with officials of the FCC's Office of Engineering & Technology ("OET") concerning the pending proceeding on ultra-wideband ("UWB") systems in Docket 98-153. FCC officials present at the meeting were Ed Thomas, Chief of OET; Julius Knapp, Deputy Chief of OET; Michael Marcus, Associate Chief of OET (Technology); Ira Keltz, Deputy Chief of OET's Policy and Rules Division; and John Reed, OET Engineer. Attending the meeting for MSSI were Robert J. Fontana, President of MSSI; Robert W.T. Mulloy, Vice President and COO of MSSI; E.J. Knight, Director of MSSI: Peter McClosky, Chairman Emeritus of the Electronic Industries Association; and John Logan and the undersigned of the law firm of Dow, Lohnes & Albertson, counsel to MSSI.

During the meeting MSSI provided information regarding current trends in UWB Systems in the United States, as more fully reflected on the attached PowerPoint presentation shown at the meeting. The attendees also discussed issues presented in MSSI's June 14, 2002 Petition for Reconsideration of the Commission's *First* ***Report*** *and* ***Order*** in this Docket. Finally, MSSl representatives demonstrated certain communications, radar and geolocation systems that utilize UWB technology.

In accordance with Section 1.1206 of the Commission's rules, two copies of this tiling are being provided *io* the Secretary for inclusion in the public record.

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Should any question arise with regard to this matter, kindly communicate with the undersigned.

Very truly yours,

Raymond G. Bender, Jr.
Counsel for Multispectral Solutions, Inc

Enclosure

cc: w/ Ed Thomas, Chief of OET
Julius Knapp, Deputy Chief of OET
Michael Marcus, Associate Chief of OET (Technology)
Ira Keltz, Deputy Chief, OET Policy and Rules Division
John Reed, OET Engineer

Current Trends in UWB Systems in the USA

Implementation, Applications and Regulatory Issues

Advanced Radio Technology Symposium 2002

Tokyo, Japan

Robert Fontana, Ph.D.

President

Multispectral Solutions, Inc.

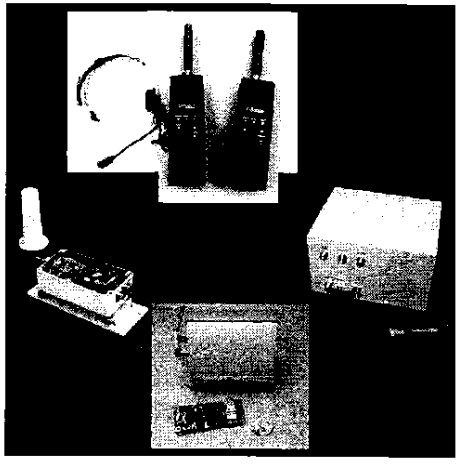
Germantown, MD USA

rfontana@multispectral.com

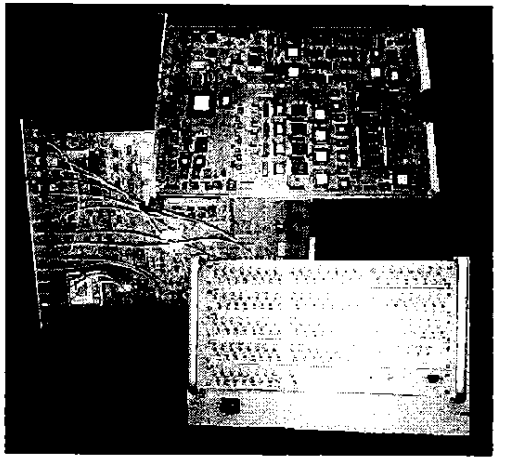
MULTISPECTRAL SOLUTIONS, INC.

Multispectral Solutions, Inc.

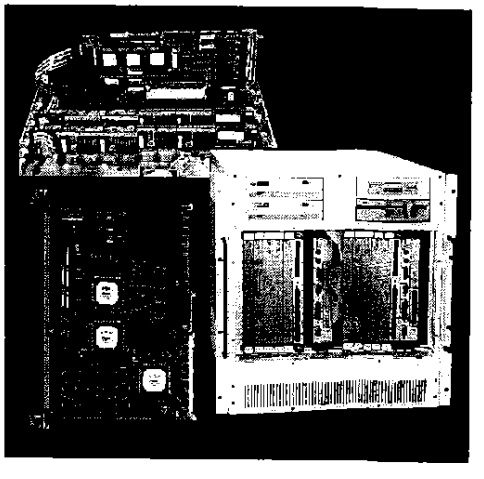
- Small Business
  - Founded in 1988
  - Dr. Robert Fontana (Ph.D. Stanford, S.M. MIT) founder
- U.S. Industry Leader in Rapidly Emerging UWB Technology
  - Over 60 UWB hardware contract awards from Government, military & commercial firms



Ultra Wideband Systems



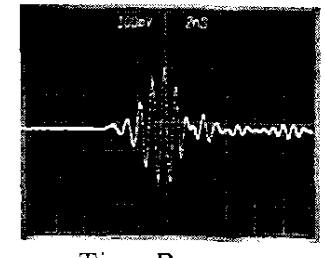
Satellite Systems



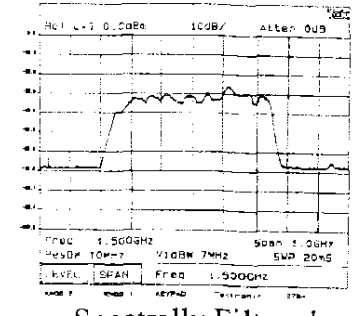
High-speed Parallel Systems

What is Ultra Wideband?

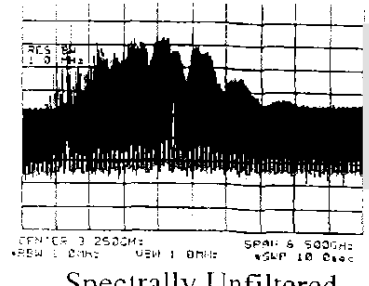
- Short pulse waveforms
  - "Carrier-free","baseband","impulse"
  - **A** few cycles of an RF carrier
- Very large fractional bandwidths
  - Bandwidth inversely proportional to pulse duration
  - Typically > 20% (FCC 2002 definition)
  - Low duty cycles resulting in low average energy densities
- Typically produced by "impulse- or step-excited" antennas, filters, etc.
  - Not all UWB is non-interfering (Regulatory issues)
    - Spectrally filtered
    - Spectrally unfiltered



Time Response



Spectrally Filtered



Spectrally Unfiltered

UWB Technology Development

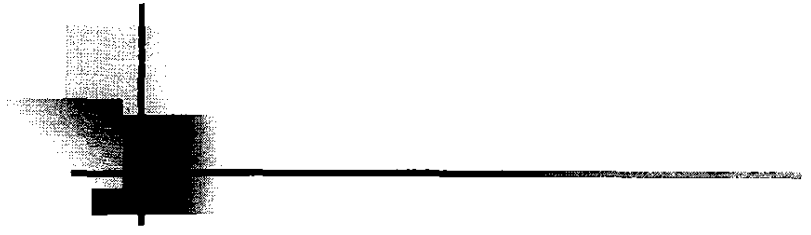
Further info on UWB technology and history:
www.multispectral.com/UWBFAQ.html
www.multispectral.com/history.html

Unique UWB Properties

- Extremely difficult to detect
- Non-interfering to other systems
- High multipath immunity
- Frequency and bandwidth adaptive
- Common architecture for communications, radar & positioning (software re-definable)
- Low cost - nearly “all-digital” architectures

Major UWB Application Areas

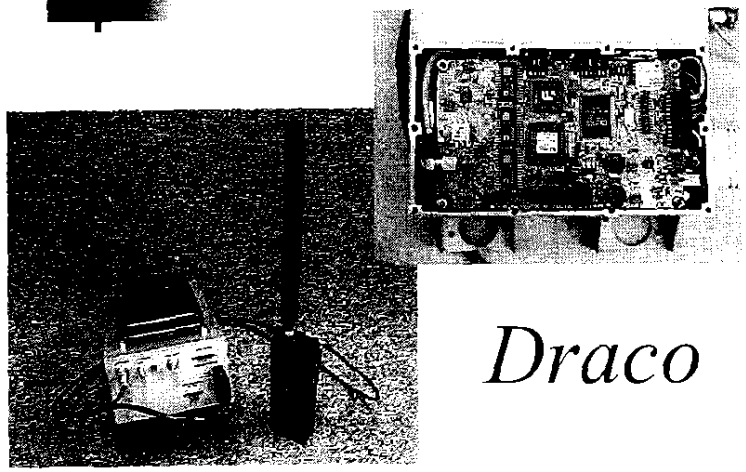
- Communications
  - LPD (Low Probability of Detection)
  - Wireless Audio, Data & Video Distribution
  - RF Tagging & Identification
- Radar
  - Collision/Obstacle Avoidance
  - Precision Altimetry
  - Intrusion Detection ("see through wall")
  - Ground Penetrating Radar
- Precision Geolocation
  - Asset Tracking
  - Personnel localization



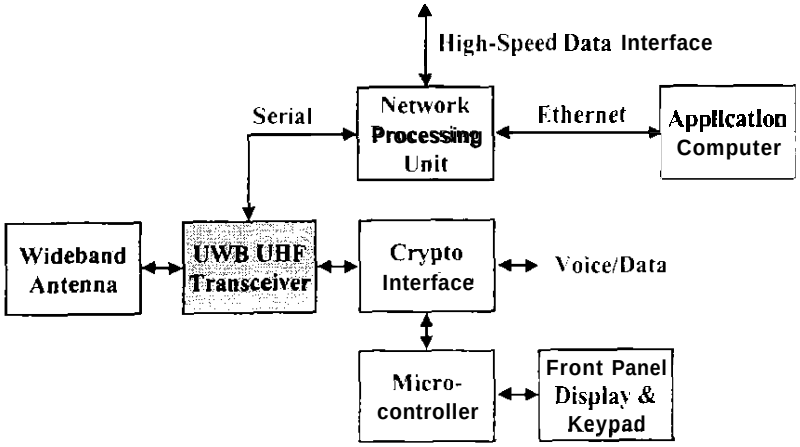
Ultra Wideband Communications Systems

Multispectral Solutions, Inc.

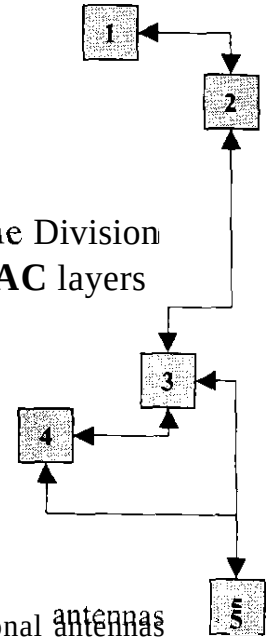
UWB Wireless *ad hoc* Networks



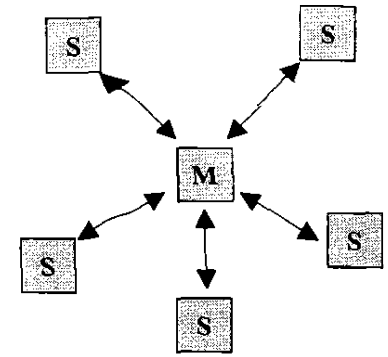
Draco

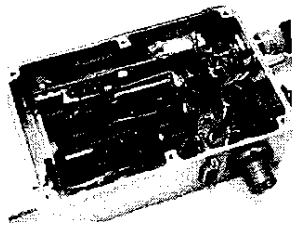


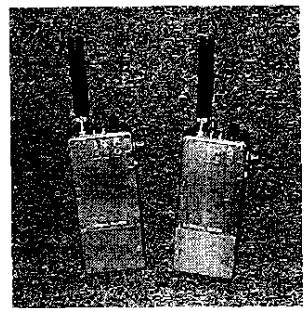
- High-speed, multi-user UWB network
- Mobile ad *hoc* network
  - Multi-node, multi-hop capability
- Frequency Division Multiplex (FDM)/Time Division Multiple Access (TDMA) physical and **MAC** layers
- > 20% fractional BW – VHF/UHF
- Data Rates
  - I28 kb/s voice, 115.2 kb/s data
  - 1.544 Mb/s (T1) virtual channel
- Range
  - 1-2 km (node-to-node) with omni-directional antennas
- Applications: communications node; unattended communications relay; originating sensor (e.g., video. seismic, acoustic, etc.); reachback packet node (satellite)
- Commercial Applications: wireless intercom systems: wireless PAN/LAN; video/data/voice distribution (in-home)



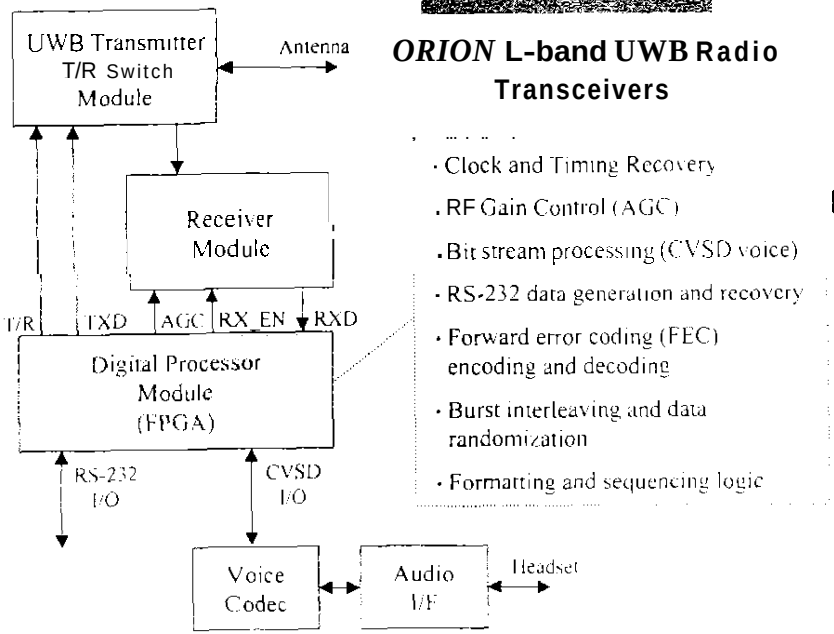
UWB Wireless Networks





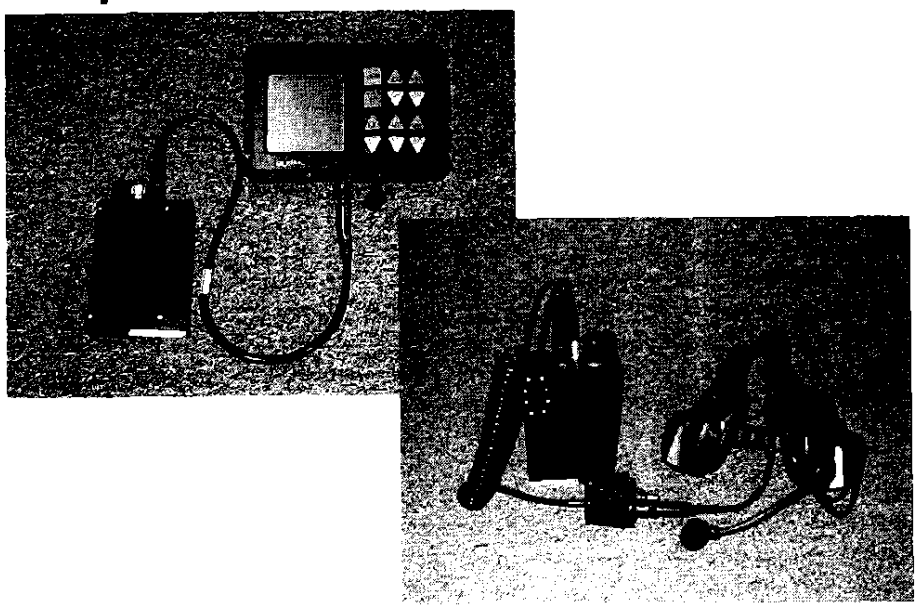


***ORION* L-band UWB Radio Transceivers**



- Composite short range UWB network with long range (non-LOS) capability via frequency diversity
- Network configuration
  - Single master unit with multiple slave transceivers in Star Topology
  - Symmetrical, full duplex links
  - Modular architecture
- System parameters
  - Dual Frequency
    - L-band handheld with 30% fractional bandwidth (short range ~ 1 km LOS)
    - VHF-band surface wave with 50% fractional bandwidth (long range ~ 50 km non-LOS)
  - Full duplex digital voice and data
    - 2 Mb/s serial interface
    - Packet burst with single-pulse detection

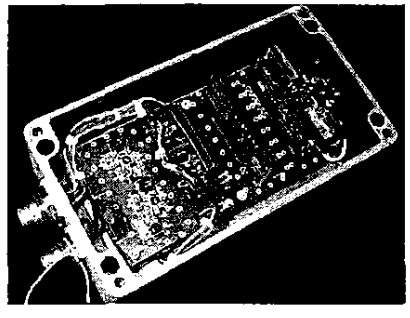
UWB Wireless Networks

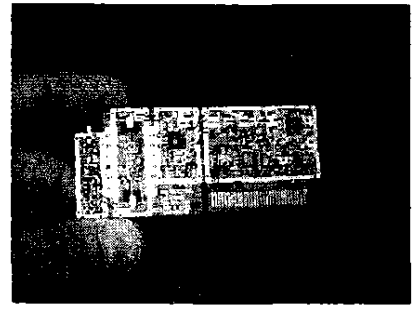


***Boat Intercom System BICS* L-band UWB Radio Transceiver**

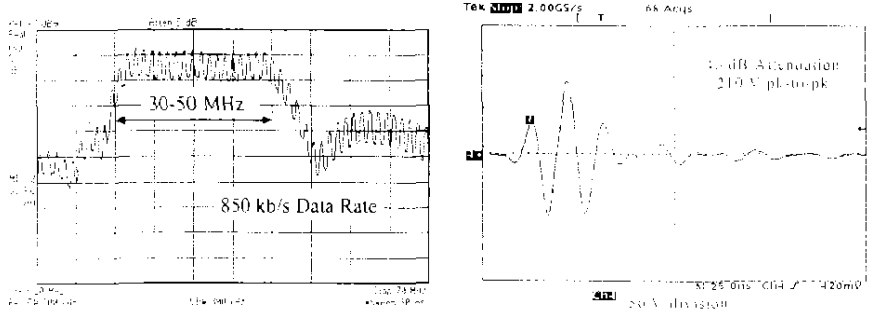
- Short range UWB wireless link between headset and existing wired intercom system (ICS)
  - Communications link to replace cords in wired ICS
  - Provides untethered crew operation in highly dynamic, combat environments
  - ***BICS***: Wireless ICS for small combat craft with up to 8 crew stations
  - ***WICS***: Wireless ICS for aircraft with up to 24 crew stations
- Network configuration
  - Self-referencing packet burst TDMA architecture with multiple simultaneous users
  - 256-bit encryption for data security

UWB Non-LOS Transceivers





Modular HFUWB UWB Transceiver Architecture
(Transceiver with RF front end module)



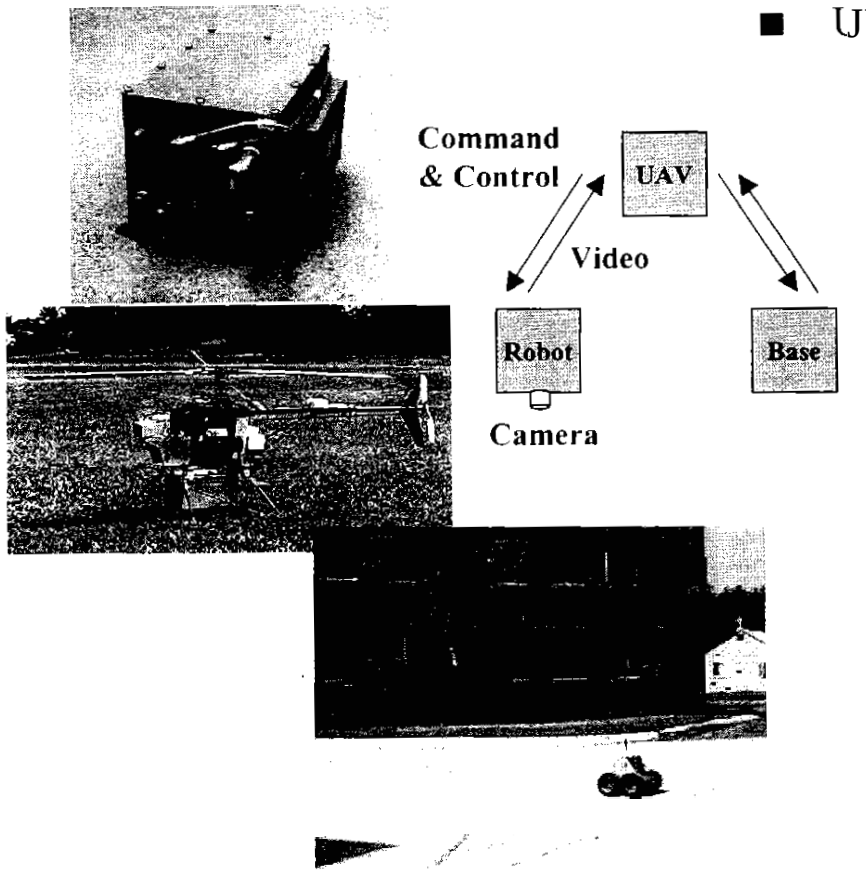
Power Spectrum and Time Domain Waveforms

- Extended range operation (> 20 **km)** in non line-of-sight conditions utilizing surface propagation of the UWB electromagnetic signal.

$$P_R \approx \frac{(h_T h_R)^2}{d^4} G_T G_R P_T$$

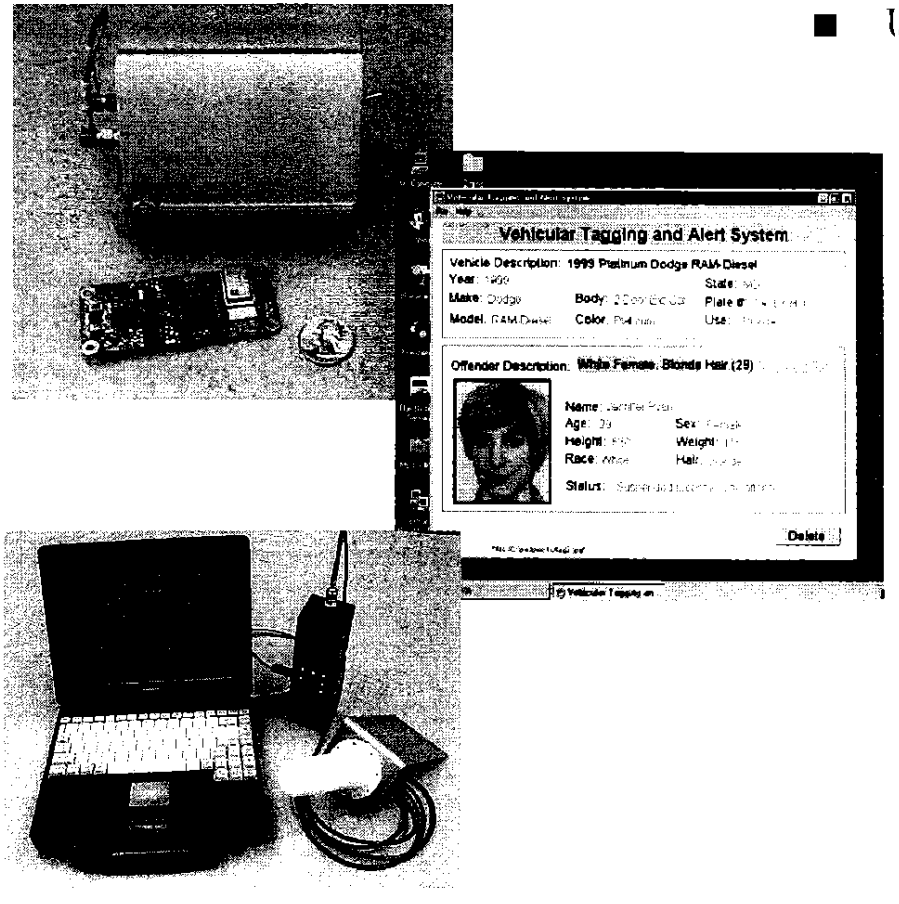
- Uses natural tendency of EM field to propagate along earth/atmosphere boundary
  - Surface wave propagation can extend over large distances (10's to 100's of km)
  - Signal losses considerably less than with direct wave transmission
  - Essentially a low frequency phenomenon – increasingly inefficient as the frequency exceeds the HF band (i.e., above 30 MHz)
- Applications: wireless access for remote facilities

UWB Video Transceivers



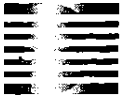
- UWB Data and Video Relay
  - Command & control uplink and video downlink for UAVs and ground robots
  - Full duplex TDMA packet burst
    - Command & Control uplink (1 15.2 kb/s)
    - Video downlink (1 -6 Mb/s MPEG compressed)
  - 2W peak power
  - 400 MHz instantaneous bandwidth
    - Spectrally shaped waveform design
    - L-band center frequency
    - 30% fractional bandwidth
  - Range
    - 8 km Line-of-sight (LOS) with omni-directional antennas

UWB Tags



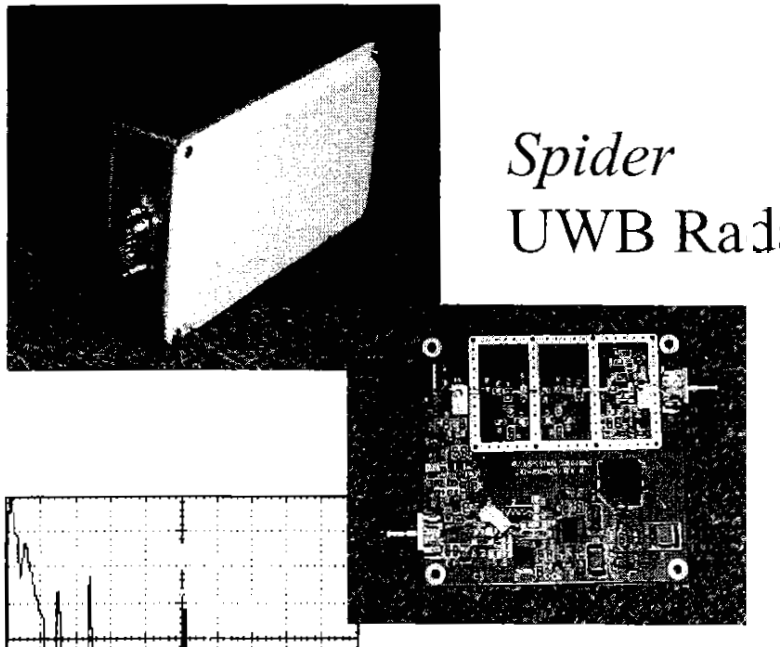
- UWB Tag
  - Developed for U.S. Department of Transportation as a means for detection and identification of problem drivers
  - Vehicle-to-roadside communications of driver & vehicle information (image, data)
  - 0.2W peak, 400 MHz instantaneous BW
    - Spectrally shaped waveform design
    - L-band center frequency
    - 30% fractional BW
    - 115.2 kb/s packet burst mode
  - Range
    - 250 meter range in high multipath environment
    - 600 meter range (line-of-sight)
  - Power consumption
    - Latest version 2.6V @ 20 μA

Ultra Wideband
Radar and Geolocation Systems

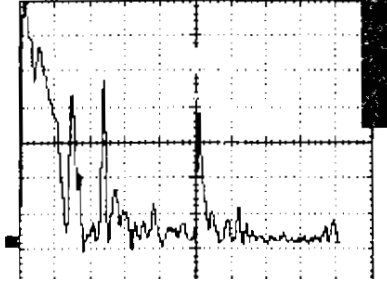


MULTISPECTRAL SOLUTIONS, INC

UWB Radar Sensors



Spider
UWB Radar



Raw Video From C-band UWB
Through-the-Wall Radar

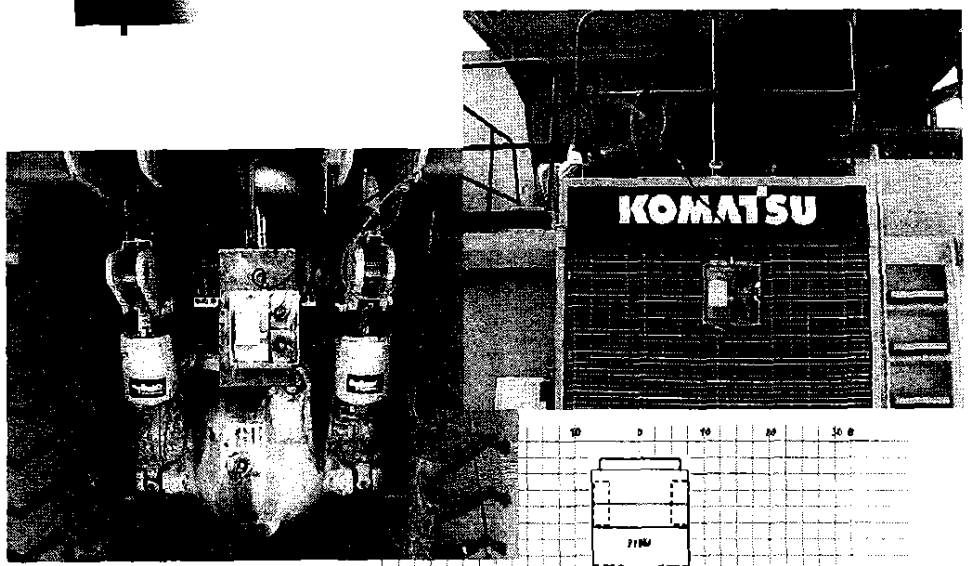
- C-band Single-Board Radar Sensor
  - Peak Power: FCC Subpart F
  - Bandwidth: *650* MHz instantaneous

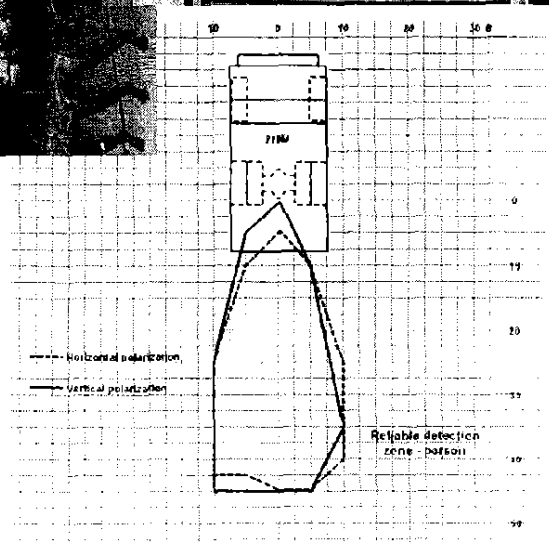
    Resolution: *0.3* meters
  - Range: 75 meters (human target)
    - Slightly higher power version tested to 1700 meters as altimeter

    Interface: RS232/485

    Size: 15.8 x 8.9 *x 3.6* cm (with dual patch antenna)
- Applications
  - Intrusion detection
  - Collision and obstacle avoidance (wire detection, vehicular applications)
  - Proximity sensors
  - Precision altimetry

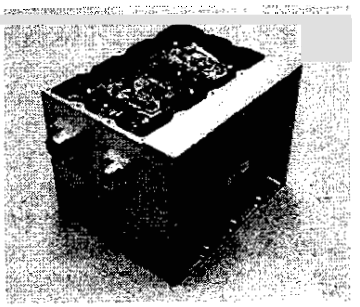
UWB Radar Seiisors

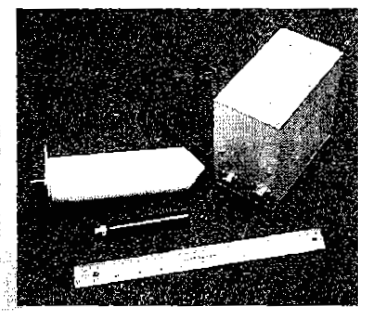


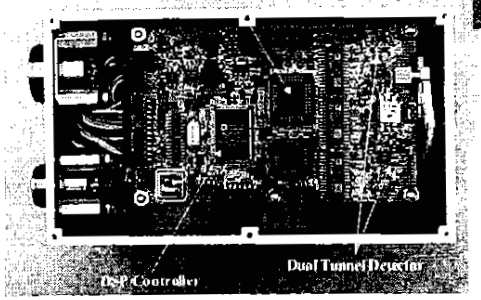


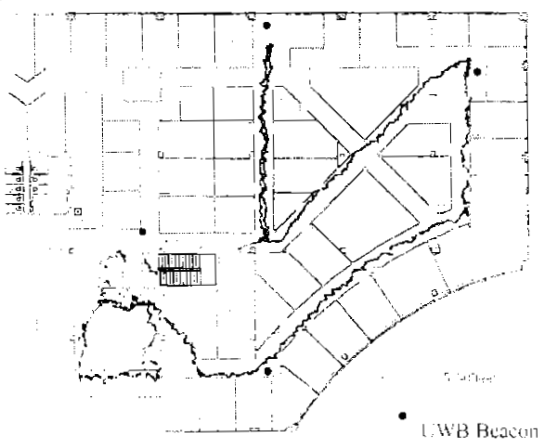
- C-band Radar Sensor
  - Peak Power: 1.8 Watts
  - Bandwidth: 600 MHz instantaneous
  - Resolution: 0.3 meters
  - Range: Designed for 0 to 20 meters (human and vehicular targets)
  - Interface: Custom display (with audible alert)
- Properties
  - Very high immunity to false alarms from rocks and debris
  - High resolution
  - Range gated for suppression of ground clutter

UWB Geolocation Sensors







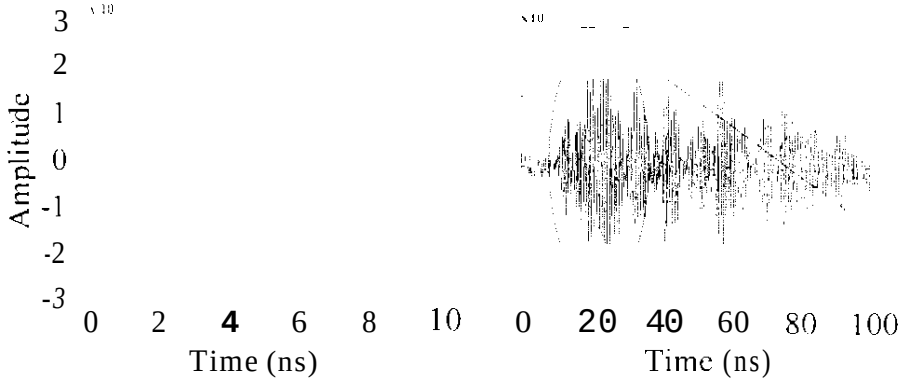


- UWB TOA Geolocation System
  - 3-D position from precise time-of-arrival (and differential time-of-amval) measurements
    - UWB mobile unit with multiple untethered UWB Beacons
  - Implementation
    - 400 MHz instantaneous BW
      - Spectrally shaped waveform design
      - L-band center frequency
      - >25% fractional BW
      - Packet burst, 100 updates/second
    - Leading edge detector for sub-foot resolution
    - Range
      - Up to 2 km outdoors

        Up to 120 meters indoors (5-25 dB/wall measured attenuation)

Typical Indoor UWB Channel

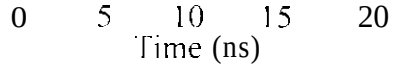
Typical Multipath Conditions

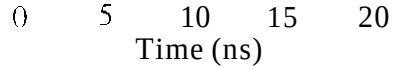


Free space measurement of UWB transmit pulse

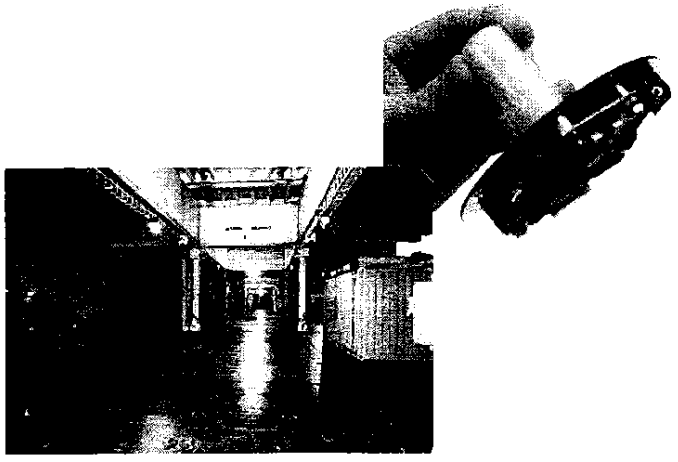
12.8 meter "Hallway" pulse reverberation

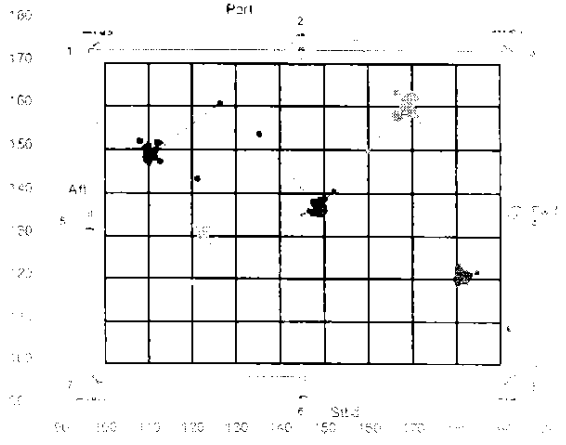
Another "Hallway" response exhibiting close-in multipath





UWB Geolocation Sensors





- Precision Asset Location System (PALS)
  - UWB Differential TOA Geolocation System
  - 3-D position from precise differential time-of-flight measurements
    - UWB Rover with multiple tethered UWB Receivers
    - Daisy-chained CAT-5 cables relay processed time-of-arrival data
  - Implementation
    - 0.25W peak, 400 MHz instantaneous BW
      - Spectrally shaped waveform design
      - L-band center frequency (C-band FCC-compliant commercial version completed)
      - >25% fractional BW
      - Packet burst, 12 updates/minute
    - Leading edge detector for sub-foot resolution
    - Range
      - 30+ meters indoors (low power units)
      - 2.6V @ 20μA tag power